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(54) HEAT PIPE AND METHOD OF MANUFACTURING HEAT PIPE

(57) A heat pipe includes (1, 5) an inlet port (90, 91). The inlet port (90, 91) includes an unsealed part (90a, 91a) and a sealed part (90b, 91b) that include metal layers that are a first outermost layer (901), intermediate layers (902-905) stacked on the first outermost layer (901), and a second outermost layer (906) stacked on the intermediate layers (902-905). In the unsealed part (90a, 91a), the intermediate layers (902-905) include respective openings (902x-905x) and respective first and second walls (902a-905a, 902b-905b) on first and second opposite sides, respectively, of the openings.

(902x-905x). The openings (902x-905x) form an injection channel (908) defined by the first and second outermost layers (901, 906) and the first and second walls (902a-905a, 902b-905b) of the intermediate layers (902-905). The inner wall faces (902s-905s) of the first walls (902a-905a) and the inner wall faces (902s-905s) of the second walls (902b-905b) of at least two adjacent intermediate layers form a first step and a second step, respectively. In the sealed part (90b, 91b), each metal layer contacts one or more of other metal layers to hermetically seal the inlet port (90, 91).

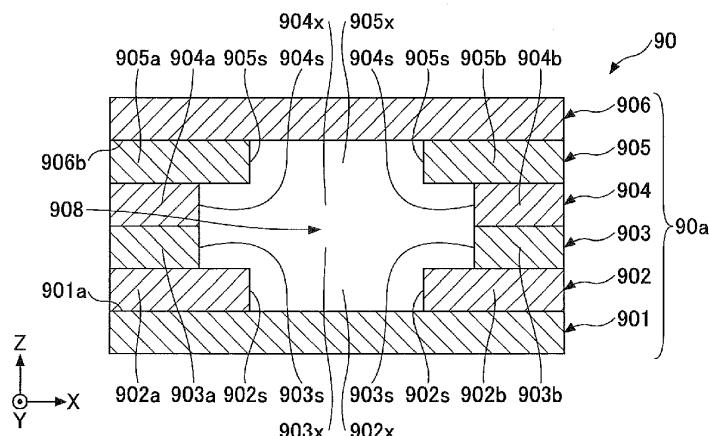


FIG.4



## PARTIAL EUROPEAN SEARCH REPORT

Application Number

EP 18 15 7243

under Rule 62a and/or 63 of the European Patent Convention.  
 This report shall be considered, for the purposes of  
 subsequent proceedings, as the European search report

| DOCUMENTS CONSIDERED TO BE RELEVANT   |   |   |   |
|---|---|---|---|
| Category  | Citation of document with indication, where appropriate, of relevant passages   | Relevant to claim                                   | CLASSIFICATION OF THE APPLICATION (IPC) |
| X   | US 2016/259383 A1 (SHIOGA TAKESHI [JP] ET AL) 8 September 2016 (2016-09-08)<br>* the whole document *<br>-----  | 4-7   | INV.<br>F28D15/02                       |
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| A   | US 2002/135979 A1 (ESTES KURT A [US] ET AL) 26 September 2002 (2002-09-26)<br>* abstract; figures 3,4 *<br>-----  | 4-7   |   |
| INCOMPLETE SEARCH   |   |   |   |
| 35  | The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out. |   |   |
| 40  | Claims searched completely :  |   |   |
| 45  | Claims searched incompletely :  |   |   |
| 50  | Claims not searched :   |   |   |
| 55  | Reason for the limitation of the search:<br>see sheet C   |   |   |
| 1   | Place of search<br>Munich   | Date of completion of the search<br>17 October 2018 | Examiner<br>Bloch, Gregor               |
| CATEGORY OF CITED DOCUMENTS   |   |   |   |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document   |   |   |   |
| T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |   |   |   |

**INCOMPLETE SEARCH  
SHEET C**Application Number  
EP 18 15 7243

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Claim(s) completely searchable:  
4-7

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Claim(s) not searched:  
1-3

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## Reason for the limitation of the search:

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Claims 1 and 4 have been drafted as separate independent claims for a heat pipe. Contrary to the reasoning given by the applicant in the main request filed on 8.10.2018, these claims do not fall into an exception laid out in Rule 43(2)(c) EPC, because the subject matter of claims 1 and 4 does not provide alternative solutions to a particular problem. Rather, claim 1 refers to the structure of a layered inlet for a heat pipe, while claim 4 further introduces the features of separate regions of layered material perpendicular to the stacking direction. These features solve different technical problems and therefore do fall into the exception laid out in Rule 43(2)(c) EPC. The main request filed on 8.10.2018 can therefore not be followed.

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As requested by the applicant in the auxiliary request filed on 8.10.2018, the search has been based on independent apparatus claim 4 and method claim 6 and the claims dependent thereon.

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-10-2018

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